GRAYWATER



IN YOUR GARDEN

June 5, 2010
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"Whiskey is for drinking, water is for fighting over."

--Mark Twain

What is avg. daily water use worldwide?

- United States 150 gal/day/person
- Europe 75 gal/day 50% of US usage
- Asia 22 gal/day 14% of US usage
- Africa 12 gal/day
- Gambia, Africa 1.3 gal/day

How much do we really need?

The World Health Organization recommends
13 gallons per day
per person
to meet basic health and sanitation needs

Water shortages in the West

- Colorado River provides water to 30 million people in seven states
- Has been in a drought for the past eight years
- Arizona – 40% increase in population between 1990 and 2000
- Nevada – 66% increase in population same time frame

Water shortages Western states

- **Lakes Mead, Powell may dry up by 2021, study says**
  - Several states would lose key water sources, scientists warn
  - Study by San Diego's Scripps Institute of Oceanography
  - No hydro power from Hoover Dam

100-foot bathtub ring around Lake Mead, NY Times magazine, Oct. 2007

Water shortages
Northern California

- Fourth year of drought?
- Rain only a temp fix.
- San Jose Water Co.
  - Tiered water rates in fall 2008
  - 32% water increase proposed for thru 2010-2012

Sources of water

- Municipal supply
- Reclaimed (recycled) water
- Rainwater harvesting
- Graywater

What is graywater?

- Water from sinks, showers, and laundry tub

- No water from toilets (black water)
- No water from kitchens sinks (food particles)
- No water from laundry if used to clean diapers
- No water containing any harmful chemicals, including bleach

Using graywater is one part of the solution

Water expert Larry Farwell estimates that extensive graywater recycling could save more than 16% of the state's residential water use.

April 19, 2009 LA Times article.

Graywater

- Produced all year long
- Small tanks, if any
- Only hold < 24 hours
- Not for some vegetables
- Salts can build up from soaps unless flushed
- 29,000 gallons / six months for four people and all hookups
- Permits required for larger systems

Rainwater

- Produced in wet season and held until dry season for landscapes
- Large tanks
- Pure, great for all vegetables
- 25,000 gallons for 1500 sf house and 18" of rain per year
- No permits required except for electrical & grading

Is Graywater irrigation safe?

- 1992 $500,000 study* of eight households in Los Angeles. Checked monthly showed no harmful organisms in soil
- New $450,000 study: "Long Term Effects of Landscape Irrigation Using Household Graywater"** Full results come in 2011

*City of Los Angeles, Office of Water Reclamation (CLA,OWR). 1992. **"Gray water Pilot Project: Mid-Course Report"**. Los Angeles, CA.

** Virginia-based Water Environment Research Foundation & Colorado State University

Graywater Advantages

- Reduces the amount of water needed
- Reduces maintenance for septic systems
- Reduces load on municipal sewer and waste water treatment systems (credits for multi-unit residential, commercial and industrial use)
- Keeps (expensive) landscapes alive during drought – mature landscapes valued at $20/ sq. ft.
- Little “infrastructure” as opposed to reclaimed water

Disadvantages

- Not for plants that like acidity – unless pH is balanced
- Need to be careful what you put down the drain—no chlorine, no boron, salts
- Liquid detergents better than powders

Where can you use graywater in the landscape?

- Fruit trees & vines
- Veggies-edible part can't touch GW
- Perennials, shrubs, groundcovers, and lawns (complex systems)
- Not on root vegetables
- Not on seasonally planted annuals
- Not in the house, yet

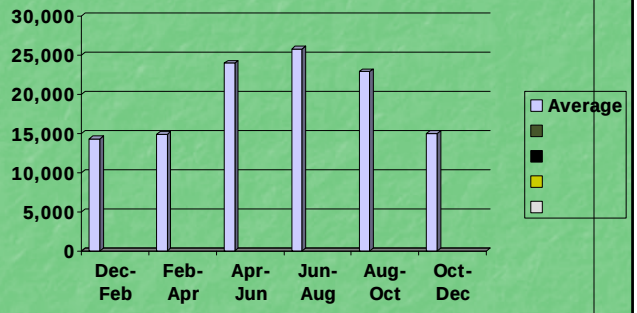
How much GW do you have?

- Compare your winter and summer water bills – the difference is your indoor water use.
- Analyze your use:
  - Amount of showers and length
    - Low flow shower head – 2.5 gal/min 10 minute shower= 25 gallons
  - Type of washer and # of loads
    - Top loaders:40 gal, front loaders: 10-20 gallons each time

Water Use in Typical Bay Area Home

Water use in dry summers almost twice that of wet winter months

- Estimate of 40 gallons of gray water produced per day per person
- Family of four can produce about 9,600 gallons per two month water billing period
- Just about the water required for “typical” Bay Area landscape



Graywater costs

- Laundry to landscape
  - $100-$200 materials only
  - $700-$2,000 full installation
- Single fixture branched drain system
  - $200-$400 materials only
  - $800-$3,000 full installation
- Complex systems with tanks & pumps
  - $400-$600 materials only
  - $2,000-$6,000 full installation

New Calif Code – Chapter 16A

- Enacted as emergency regulation in August 4, 2009
- Included in California Plumbing code
- May be prohibited only after public hearing and enactment of Ordinance
  - San Francisco tried to prohibit
  - LA County trying to prohibit now
  - Santa Clara County is considering options

Graywater "Do's"

- Be able to easily switch back to sewer
- Label your system
- Discharge under 2" mulch/rock/cover
- Direct water to irrigation field (no storing more than 24 hours)
- Minimize contact with humans and pets
- Have a maintenance manual

Graywater "Don'ts"

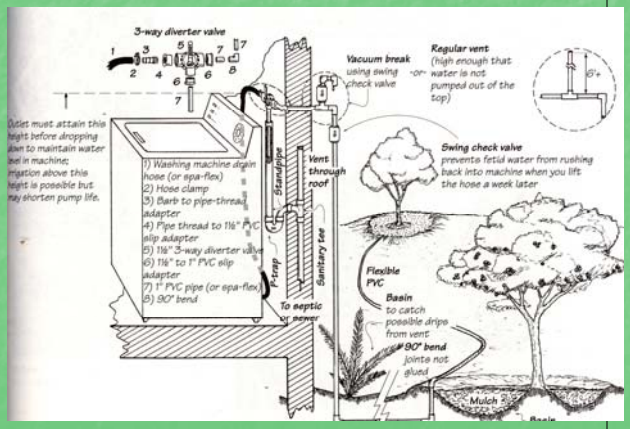
- Have ponding or runoff
- Discharge into neighbor's yard
- Connect to potable water supply
- Include a pump (more room for error)
- Violate other codes/laws
- Damage building
- Use diaper wash water or hazardous chemicals (oily rags, etc.)

Clothes washer systems

- Description
  - Uses the washing machine pump (can go a little uphill)
  - Can be filtered or not
  - Best for larger plants
- Pros
  - Least expensive
  - Low maintenance, low-tech (but high value system)
- Cons
  - Not good for small plants or lawns

Clothes Washer

- No PERMIT!
- 1-2 households
- Only two inches of coverage
- No ponding
- Operation and maintenance manual required



Drawing from: *Create an Oasis with Greywater* by Art Ludwig

Laundry drum (surge tank)

When you are renting, or have hardscape next to house.

Laundry to landscape

Run a PVC line out of the house

This is from the 2nd story

Connect the PVC to 1” black poly tubing

Flexible polyethylene irrigation tubing is a better environmental choice.

Dig trenches for the pipes

They don’t have to be deep; you just don’t want anyone to trip over them.

Use 1” x ½” barbed tee emitters.
Don’t cap the end.

This prevents clogging by lint . . .or pennies

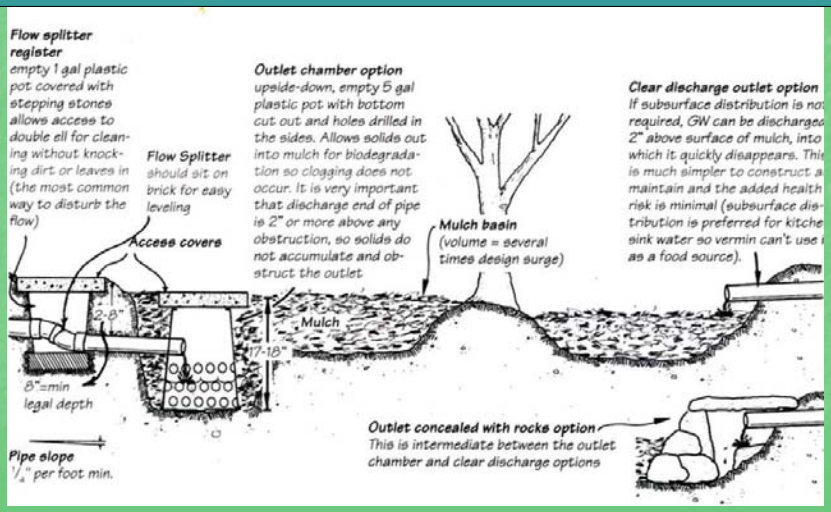
Laying pipe

Ornamental bed
With mulch basin shields

Send emitters to mulch basins

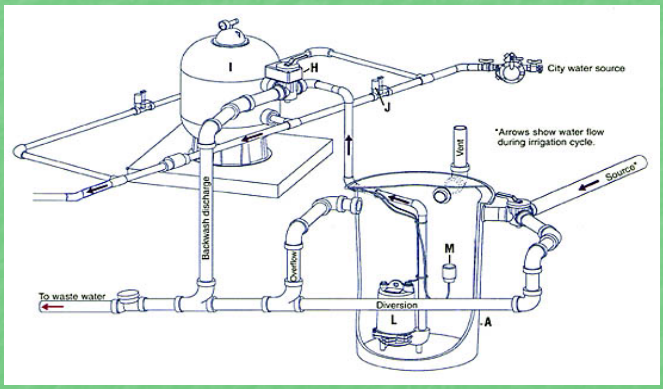
Check the flow rates. Add little ball valves on some emitters to adjust the rates.

Mulch basins



Drawings from: *Branched Drain Greywater Systems* by Art Ludwig

More complex systems



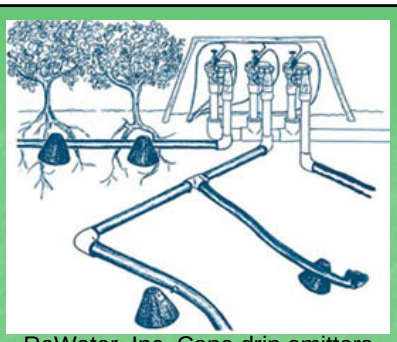
Surge tank, pump, and filter

Source: ReWater, Inc.

Simple and Complex System

- Special Emitters
- Complex controllers
- Automatic filter backwash
- Fresh water supplementation

Techline purple for recycled water



ReWater, Inc. Cone drip emitters

ReWater's Complete Control irrigation controller

Simple and complex systems

- Description
  - Pumped and filtered
- Pros
  - Can pump uphill
  - Water lawns, shrubs and trees, just like any drip system
  - Backup with city water (when on vacation)
  - Use drip irrigation, which is 95% efficient
  - Automatic irrigation with controller
  - Good for multi-unit and commercial sites
- Cons
  - Most expensive – from $5,000-$8,000
  - Most complicated – must be installed by professionals
  - Does not clean out chemicals, soaps, only particles

Lawn Irrigation Installation

Photos from ReWater, Inc.

Lawn five years after installation

Sunnyvale home – installed 2006

Sand filter from ReWater

Surge tank in vault

Lawn with subsurface drip tubing from Netafim, installed by EarthCare Landscaping, plumbing by Hal Branges

Example of Commercial Subsurface Drip

- Laundromat with 60 washers, some 100 gallons in Chula Vista
- 750 gallon surge tank
- 15,000 sq. ft. of landscaping area
- Surge tank and filter installed under parking lot
- Received a credit from sewer district
- Payback estimated in 3½ years

Manhole cover on surge tank under parking space – photo from ReWater, Inc.

Subsurface Drip graywater issues

- ~$6,000 + greater than typical drip system
- Subsurface drip – more efficient than standard drip system since below grade
- Extra labor for trenching and installing equipment, especially on lawns
- Not great around established trees, hard to trench
- Especially appealing for new construction, more complicated for remodels
- Multi-unit residential, commercial & industrial sites can get credit for reducing sewer use

Where to get parts?

- Urban Farmer for brass and/or Jandy 3-way valves: ¾", 1" or 2-1/2" valve
- Brass three-way valve at hardware or plumbing supply store
- Air gap assemby – any hardware store
- 1" PE (polyethylene) tubing at Ewing Irrigation (have to order) or Urban Farmer (Blu-Lok in 100' rolls)
- Double ells (RV Cloud or Ashby Plumbing or Oasis.com)
- Actuators for 3-way valves? Check with www.greywateraction.com

What soaps to use?

Not all biodegradable products are good for plants. . .

. . .think biocompatible!

Ingredients to avoid

Read the labels

- Salt, sodium compounds
  damages soil
- Boron, borax (Bon Ami)
  micronutrient turns into a microtoxin
- Chlorine
  kills bacteria/life (hydrogen peroxide better)

Use these laundry products

- Oasis
- ECOS (available at Costco and Whole Foods)
- Bio pac liquid detergent
- Wonder balls or Soap nuts

- **No** powdered detergents, salt, borax, bleach, water softener

Shower and sink products

- Aubrey Organics shampoo and conditioner
- Dr. Bronner's
- Oasis all purpose cleaner

- **No** bleach, hair dye, harsh cleaners, salt baths, epson salts

Cleaning products

- Vinegar based cleaners
- Liquid soap based cleaners
- Dr. Bronner's

- **No** high salt products, bleach, harsh cleaners

A VERY easy graywater system:

Sink Positive!

www.sinkpositive.com

Other related ideas

Conservation

- 1 gpm shower heads
- Shower shut off valves
- Dual flush toilets
- Ultra low flush toilets
- Sink shut off switches
- Recirculating pumps for hot water and more!

And more

- Rainwater Harvesting - 2000sft roof captures 1100 /inch of rainfall

EarthWorks
(reshape land to keep water onsite)

- Swales
- Berms
- Pervious sufaces
- Curb cuts in parking lots to planted areas
- Check dams to catch water

Resources & References

- *Create an Oasis with Greywater* by Art Ludwig
  http://oasisdesign.net
- Greywater Guerrillas, authors of *Dam Nation*
  www.greywateraction.org
- Complete graywater system: Rewater, Inc.
  www.rewater.com
- Many slides courtesy of Sherri Osaka -- Sustainable Landscape Designs
- Take a DIY graywater class: www.greywateraction.org

The End . . .

. . . or is it just the beginning?